ENERGY BASICS

Hotel energy consumption depends on many factors, such as geographical location, size, class, equipment, system, occupancy and age of facility. These factors affect the cost-effectiveness of certain measures and the magnitude of savings.

Two federal programs provide background information and a good starting point for hotel energy upgrades. The U.S. Environmental Protection Agency Energy Star Buildings program-a voluntary program designed to help commercial buildings retrofit for energy efficiency-recommends key steps to energy efficiency. For more information, contact the Energy Star Buildings Program at (202) 775-6650.

The U.S. Department of Energy (DOE) also has a program designed to encourage energy conservation in the hospitality industry. Called "Hospitality Industry Forum for Energy Conservation," the Forum provides financial and technical support for industry demonstration projects. For more information, contact the Forum at (301) 588-9387.

In general, there are four areas of hotel operation where most facilities can generate savings through energy-efficiency.

- Lighting
- Heating, ventilation and air conditioning
- Laundry and kitchen
- General operations (such as swimming pools, pumps, steam boilers)

An environmental audit form and an energy work sheet are included in the appendix to help estimate your potential energy savings.

MANAGING ENERGY IN HOTELS

Conduct an energy audit before any major retrofit or upgrade projects are implemented, either in a specific area (such as lighting or HVAC) or hotel-wide. Beyond providing an assessment of current performance, a comprehensive energy audit helps identify appropriate measures by providing cost information and setting realistic performance goals. Experts also recommend a systematic approach, because some projects can generate secondary effects and savings (for example, switching to energy-efficient lighting can reduce cooling loads).

KEY QUESTIONS

Use these questions to identify areas where conservation can yield the most savings.

- What are the top two areas where you use the most electricity?
- Do you have a maintenance schedule for the heating, ventilation and air conditioning (HVAC) systems on your property?
- Are HVAC systems checked and adjusted seasonally prior to heavy use periods?
- Do you take steps to minimize heat sources (e.g., incandescent lamps, sunlight) on the property during cooling season?
- Do you consider energy efficiency in your equipment purchases?

Economic analysis is an important but under-utilized tool for energy management. Analysis methods-such as calculations of return on investment, capital recovery factor or internal rate of return-can provide powerful arguments for energy efficiency projects by comparing their benefits and costs and estimating payback periods. We recommend that property energy audits be followed by a careful economic analysis that incorporates specific saving goals.

MAKING HVAC EFFICIENT

- Properly maintain the system.
- Reduce inside heat sources.
- Don't cool or heat more than necessary.
- Purchase efficient equipment.

Below is a list of energy-efficient options for hotels, organized under the four general energy-saving areas identified in Energy Basics.

LIGHTING Hotel lighting, especially guest room lighting, accounts for about 30 to 40 percent of hotel electricity consumption. The lighting section of this Guide addresses retrofitting with energy-efficient lamps and fixtures, and generally recommends replacing incandescent lights with compact fluorescent lamps (CFLs) and full-size fluorescents with T-8s and electronic ballasts. Recommendations for hotel-specific applications are also provided.

HVAC The HVAC systems are also large energy consumers for hotels, using between 25 and 40 percent of the total energy consumed. HVAC energy management involves regular maintenance, sensors and other "smart" controllers, load reduction measures and fan, motor and chiller replacement or upgrades. Added benefits of well-operated HVAC systems include increased guest comfort and better indoor air quality.

Properly maintain the system. Maintaining equipment at peak operating condition and implementing regular maintenance can help sustain system efficiency. Proper maintenance also helps avoid costly downtime by identifying potential system problems.

HVAC Systems Maintenance

- Clean permanent filters with mild detergents every one or two months, or change replaceable filters every one or two months.
- Check entire system each year for coolant and air leaks, clogs and obstructions of air intake and vents.

Room (Window) Air Conditioner Maintenance

- Check and clean the filter once each month during heavy cooling periods.
- Have the units checked every year. Spring is the best time for evaluation, because it is normally before heavy use.
- Clean unit condensers at least every two or three years.

- Make sure the appropriate amperage and voltage are available to every unit.

Reduce inside heat sources. Air conditioning systems work to remove heat from indoors and transport it to the outside. Reducing indoor heat sources helps to reduce HVAC loads and energy consumption. The following activities can help reduce heat buildup.

- Cover windows, especially west- and south-facing windows, against sunlight with drapes, shades or shutters. Select efficient windows and window films, which don't transfer as much heat into rooms.
- Turn off electric lights and appliances or other heat-producing equipment that is not in use, and reduce or eliminate incandescent lighting in favor of CFLs.
- Install programmable on/off timers and sensors for lights, appliances and room HVAC.
- Position heat-producing appliances (such as TVs and lamps) away from room thermostats.

Don't cool or heat more than necessary. Energy is wasted when the HVAC is competing with hot or cold air titration or conditioning empty rooms and other unoccupied areas. Setting the thermostat lower (or higher) than needed to speed the system does not work. It does not cool or heat faster; it only works the WAC system harder and wastes energy. Additionally, efficiency diminishes when a system tries to cool to a temperature greater than 20°F below outside temperature. Some other HVAC guidelines follow.

- Set the thermostat to the highest comfortable temperature in summer (>78°F) and the lowest comfortable in winter (<68°F), especially in empty rooms or places where the system cannot be turned off completely.
- Install programmable on/off timers and sensors for low occupancy areas.
- Turn the cooling unit(s) off when the weather is cooler.
- Use weather stripping to close air gaps around doors and windows.
- Close all unnecessary openings.

Purchase efficient HVAC equipment. Although performance and cost are usually considered when purchasing new HVAC units or replacing old ones, energy efficiency may not be a priority. Some energy-efficient units have higher initial costs, but can save money over the long run through lower operating and energy costs. Consider the following points before purchasing or replacing HVAC systems.

- Note that higher cooling capacity does not mean higher efficiency. Instead, the efficiency is measured by a high energy efficiency ratio (or seasonal energy efficiency ratio).

DEFINITIONS

COOLING CAPACITY refers to the ability of an air conditioner to cool and is expressed in British thermal units per hour (Btu/hr).

COOLING LOAD refers to the amount of heat (generated by people, lights, equipment) an air conditioner must remove from an area.

- Estimate the cooling load needed for your building(s). Work with an experienced professional to calculate load. Once the cooling load is known, buy equipment to match it.
- It is better to undersize than oversize where cooling capacity is concerned, and a continuous flow of cold air is more efficient than cycling on and off.
- Match the air conditioning or heat pump components for higher efficiency,

Good alternatives to more expensive cooling upgrades (and more energy consumption) include "passive" measures, such as light or reflective roof and exterior coatings, or even planting shade trees on the south side of low buildings to create shading. These measures reduce heat build-up in external walls and surfaces.

LAUNDRY AND KITCHEN Energy management measures can also yield savings in laundry and kitchen areas. Hotel laundry and kitchens can consume large quantities of energy and water, not to mention detergent and other chemicals. The International Hotel Environment Initiative estimates that some hotel kitchens use two or three times as much energy as private restaurants to prepare the same amount and quality of food. Savings from these areas, like savings from HVAC operations, come from large and small measures.

Properly use and maintain equipment. Kitchen and laundry equipment-boilers, washers, dryers, refrigerators, freezers, ovens and stoves-function more efficiently when they are properly used and maintained. Small maintenance steps, such as cleaning condenser coils and removing lint from dryers, are just as important as major upkeep, such as cleaning boiler tubes. Both approaches help maintain efficiency and reduce energy consumption, as does running equipment only with full loads.

Team up for efficiency. By teaming up equipment of similar or complementary functions, or separating equipment of unlike functions, efficiency can be enhanced. For example, separate stoves and ovens from refrigerators and freezers and adapt laundry operating hours to reflect actual needs. Other examples include using recovered heat from dryer exhaust or capturing water from clothes washer rinse cycles in holding tanks for use in the next wash. (For more information, see the Graywater section under Water Use.)

Look for energy-saving measures. Since white linens typically require higher wash and rinse water temperatures, switching to non-white or colored linens enables a property to reduce hot water and bleach use and lower the hot water heater setting. Alternately, switching to a low-temperature detergent formula enables you to lower the hot water heater temperature while continuing to use white linens.

Investigate alternative energy sources. Many conventional uses of energy in the kitchen and laundry areas can be adapted to unconventional energy sources. Solar hot water heating for pool and kitchen use, for example, is an excellent application of solar energy.

MAKING LAUNDRY AND KITCHENS EFFICIENT

- Properly use and maintain equipment.
- Team up similar appliances for efficiency.
- Look for energy-saving measures in dish and linen washing.

GENERAL OPERATIONS The energy-saving potential in this area varies and depends on hotel location, size, class, equipment, system, occupancy rate and age. The recommendations below are intended to serve as a starting point, and can be adapted to meet the needs of your facility.

- During periods of low occupancy, group guests in relation *to* mechanical and electrical systems. This approach translates into energy savings in unused areas.
- Operate laundry and other energy-intensive operations at night, when utility rates are lower (off-peak).
- Purchase energy-efficient office equipment. Consider purchasing controlling devices, which can turn off unused office equipment, or specify new equipment with a "sleep" feature to save energy.
- Try solar power. Use solar-powered exterior landscape lighting, or install skylights in work areas to increase available light.

CHOOSING ENVIRONMENTALLY PREFERABLE PRODUCTS

- Choose windows and skylights meeting the following criteria.[1]
  - Ratio of visible light transmission coefficient over solar heat gain coefficient > 1
  - U-value <0.36 for windows and glazed exterior doors and <0.44 for skylights
  - Air leakage rate <0.10 scfm/ft^2 for fixed products and <0.30 scfm/lfc for operable products

[1] These criteria are based on Green Seal's standards for *Windows-GS 13.*

- Frame and sash materials not formulated with lead, cadmium, arsenic, mercury or hexavalent chromium
- Packaged in materials containing 25% post-consumer recycled content and that do not contain heavy metals

- Choose window films meeting the following criteria.*
  - Ratio of visible light transmission coefficient over solar heat gain coefficient greater than 1
  - Packaged in materials containing 25% post-consumer recycled content and that do not contain heavy metals
- Purchase window air conditioning units that meet the following criteria.
  - Do not use Rll or R12, which are compounds from the CFC family, as refrigerants (Note: Where available, HFCs are more preferable than HCFCs.)
  - Do not use ozone-depleting chemicals in the manufacturing process (products must be labelled if they are manufactured with ozone-depleting chemicals)
  - Have a sensible heat factor (SHF) of less than 0.78
  - Have the energy efficiency ratio listed below

Type	Size (Btu/hr)	Minimum EER
No Reverse Cycle/Louvered	< 6,000	9.0
	6,000 to 14,000	9.5
	14,000 to 20,000	10.0
	20,000 and above	8.5
Reverse Cycle/Louvered	All Sizes	9.5
No Reverse Cycle/ Non-louvered	<6,000	8.5
	6,000 to 14,000	9.0
	14,000 to 20,000	9.0
	20,000 and above	8.7
Reverse Cycle/ Non-louvered	All Sizes	9.0

- Choose energy-efficient lighting, such as compact fluorescents and other lamps and fixtures described in the Lighting section.
- Look for high-efficiency motors and chillers.

[2] These criteria are based on Green Seal's standards for *Windows Film-GS 14.*

- Look for fans with variable speed drives and variable air volume (instead of fixed).
- Choose equipment with sensors or controllers, which enable equipment to power down or turn off during periods of inactivity.
- Install a computerized energy management system for maximum efficiency.
- Choose low-temperature detergents and those meeting other criteria described in the Water Use section.

GREEN SEAL CERTIFIED PRODUCTS

To order Green Seal-certified products, contact the following companies:

- CFLs-Lights of America, (800) 321-8100
- CFLs-General Electric Lighting, (216) 266-2884
- Windows-Andersen Corporation, (612) 430-7362

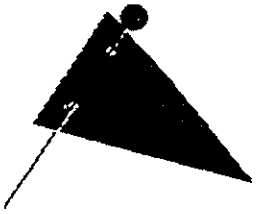
See appendix for additional products.

SUCCESS STORIES[3]

The following DOE demonstration projects in Montana have been successful in reducing energy use. For more information, contact the DOE Hospitality Forum.

RADISSON NORTHERN HOTEL

BILLINGS, MONTANA



Despite celebrating its golden anniversary in 1992, the Radisson Northern Hotel in Billings, Montana, is running like a youngster these days, thanks to the application of an innovative energy management system. Its new, high-tech heating system has accomplished the long-sought goal of the hotel management-saving money and still providing the best services possible for the guests.

The system overhaul relied on the following energy-efficient measures: (1) replacing energy-wasting incandescent lights with efficient fluorescent bulbs, (2) adding new equipment that captures waste heat to preheat the hotel's domestic water supply, and (3) installing a computerized energy-management system.

According to the general manager, the energy-efficient fixtures and retrofit brought three prime benefits to the hotel.

- The costs for power have stabilized and become predictable despite increased occupancy and higher energy rates.

[3] Reprinted with permission of Northwest Energy News, March/April 1992 and November/December 1993, respectively.

- The system promptly alerts hotel management to potential problems (so that they can be fixed before they are detected), and permits the front desk clerk to monitor and adjust things like temperatures in guest rooms.
- The system allows for upgrades and retrofits to yield even greater efficiencies and savings.

No wonder the Radisson Northern looks forward to another 50 years of savings!

THE 4BS INN

MISSOULA, MONTANA

There is little indication that the 4Bs Inn in Missoula, Montana, is an unusual place, but the two awards displayed on the walls inside the lobby set it apart. The awards, one from the Northwest Power Planning Council and the other from the Montana Power Company, honor the 4Bs for the energy efficiency of its heating and cooling systems. In fact, the motel's heating and cooling system is so innovative that it has been patented.

Cost-saving redundancies make the system unique. The pipes that carry hot water to guest rooms also are coiled in the heaters for those rooms, giving heat and hot water from the same pipes. Similarly, the cold water pipes feed the cooling system for each room and also double as the fire protection system. The result is tremendous savings in construction costs and energy consumption. Since October 1991, the 4Bs has saved management between $700 to $1,000 a month in energy costs during winter months.

Another motel that tried the 4Bs' system is the 62-room Great Falls Day's Inn. It averages $700 per month in energy bills, or about two or three times less than normal for a building its size. According to a Montana Power Company executive, the Day's Inn "may be the most energy-efficient commercial building in the country."